
SYNOPSIS OF *CRATAEGUS*
SERIES *APIIFOLIAE*,
CORDATAE, *MICROCARPAE*,
AND *BREVISPINAE*
(ROSACEAE SUBFAM.
MALOIDEAE)¹

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ABSTRACT

This paper revises four monotypic North American series of *Crataegus* (Rosaceae subfam. Maloideae). Of these, series *Apiifoliae*, *Cordatae*, and *Microcarpae* all possess short-shoot and extension shoot leaves with secondary veins to both the lobes and the sinuses, while series *Brevispinae* only exhibits this attribute on extension shoot leaves. The brilliantly red-fruited *C. marshallii* of series *Apiifoliae* is widespread and common in the southeastern United States and is most closely related to European species, particularly in foliage characters. The species-pair *C. phaenopyrum* (ser. *Cordatae*) and *C. spathulata* (ser. *Microcarpae*) have glossy foliage and small, orange-red, orbicular fruits, and are a little less closely related to European species. *Crataegus phaenopyrum* is mid-Atlantic in range, westward to the Ozarkian area, while *C. spathulata* is a common southeastern species. *Crataegus brachyacantha* (ser. *Brevispinae*) is the most distinctive of the species treated, being black-fruited with different short-shoot foliage and restricted to Louisiana and the bordering parts of adjacent states. Line drawings and distribution maps are presented for each species described, and representative specimens are cited. The selection of taxa for this paper also reflects the fact that the author had been intending to treat *Crataegus* for the now defunct *Vascular Flora of the Southeastern United States* (vol. 1. Cronquist, 1980).

This paper is a further one of mine revising *Crataegus* (Rosaceae subfam. Maloideae) of North America. The first (Phipps, 1988) was devoted to series *Aestivales* (Sarg. ex C. K. Schneid.) Rehder and introduced the genus. This was followed by my monograph of northern Mexican *Crataegus* (Phipps, 1997) and an introduction to the red-fruited *Crataegus* of western North America (Phipps, 1998). The current paper assembles a group of monotypic series all with greater or lesser affinities to European subgenus *Crataegus*. This subgenus was established by El-Gazzar (1980) on the basis of its deeply lobed short-shoot leaves with veins to the sinuses. The taxa treated here comprise the native North American species with deeply lobed short-shoot leaves, as well as one in which the long-shoot leaves alone are deeply lobed.

El-Gazzar (1980) mistakenly held that all *Crataegus* taxa with deeply lobed short-shoot leaves possessing veins to the sinuses were Eurasian. However, there are American series with this attri-

bute, including series *Apiifoliae* (Loudon) Rehder, which fits very comfortably into subgenus *Crataegus* as perceived by El-Gazzar. Its foliage is of the typical monogynoid shape, by which I imply a shape like that of *C. monogyna* Jacq., characteristic of many European species of section *Crataegus*. Further American series possessing lobed short-shoot leaves with veins to the sinuses are series *Cordatae* (Beadle) Rehder and series *Microcarpae* (Loudon) Rehder, each of which has small flowers, small fruit (often orange-red in color), and 3–5 nuts. These last two series have no very close relatives outside North America. In addition to North American *Crataegus* species with short-shoot leaves lobed to their sinuses, there are also native American taxa of *Crataegus* that include elements intermediate between subgenus *Crataegus* and subgenus *Americanae* El-Gazzar—a reason that I am not using El-Gazzar's subgeneric taxa in this revision. The intermediate kinds are principally a group of series normally lacking veins to the si-

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nuses on the short-shoots, but usually possessing these veins on the extension shoots. It should be noted that nearly all hawthorns can produce at least a few extension-shoot leaves that are both deeply lobed and with veins to the sinuses. Clearly the distinction involved is not nearly as sharp as was once believed. Possessing such intermediate characteristics but not closely related to the above three series are series *Lacrimatae* J. B. Phipps, *Virides* (Beadle ex Sarg.) Rehder, and *Brevispinae* (Beadle) Rehder. Series *Brevispinae* is treated in this paper. Due to taxonomic complexity, however, treatment of the series *Virides* is reserved for a separate article. The same is true for series *Lacrimatae*, which is also particularly complex, as evidenced by Beadle's (1903) having included 77 species in this group. The taxonomy of series *Lacrimatae* is under active revision by the author.

Of the species considered here, *Crataegus marshallii* Eggl. (ser. *Apiifoliae*) is very close to members of series *Crataegus*; *C. phaenopyrum* (L. f.) Medik. (ser. *Cordatae*) has large, distinctive leaves, with rather triangular lobes and veins to the sinuses, but otherwise very unlike those of other hawthorns; *C. spathulata* Michx. (ser. *Microcarpae*) has curiously lobed, very small leaves, often somewhat blue to dull green, of a shape unique in *Crataegus*. Finally, *C. brachyacantha* Sarg. & Engelm. (ser. *Brevispinae*) is treated here somewhat for convenience. With black fruits, short recurved thorns, and entire short-shoot leaves, it is a very distinct American hawthorn. However, even in series *Brevispinae*, the presumably plesiomorphic (Phipps, 1983; Phipps et al., 1991) veins to the sinuses show up in the deeply lobed leaves of the long shoots.

Taxonomic difficulties in *Crataegus* are frequently held to be due to hybridization. This has been extensively documented in Europe, but while it occurs in North America, for this continent there is little documentation. Indeed, the four species treated here yield very few examples of putative hybrids, these being restricted to a handful of apparently non-persistent specimens of probable *C. marshallii* × *C. mollis* (s.l.) parentage, as discussed after *C. marshallii*.

MATERIALS AND METHODS

This study has been made possible by the loan of over 2000 herbarium specimens from 43 different herbaria. Thereby the great majority of variation within the species studied should have become evident. Typification of all species and their synonyms was attempted, although in a few cases it was too

difficult to complete. These exceptions are clearly indicated in the text.

The numbering of the species in this paper is continuous with that of Phipps (1988). The depth of lobing of leaves is quantified as the "leaf incision index" (LII), widely referred to in the text. LII is a percentage value lying between unlobed (0%) and lobed to the mid vein (100%). The flowering season is given relative to other sympatric species of *Crataegus* and ranges from "early" to "very late." Distribution maps for each species have been created by computer on the basis of recording latitude/longitude coordinates for the very large number of exsiccatae studied. Due to the few taxonomic problems encountered with the *Crataegus* species here only a reduced list of exemplary exsiccatae (one per county) is appended, while the maps show all the locations that can be separated at the scale used.

TAXONOMIC TREATMENT

The taxonomic treatment commences with a key to series and is followed by taxon descriptions with lists of representative exsiccatae. [Note: "leaves" throughout key and taxonomic descriptions refer to short-shoot leaves, unless otherwise specified. Square brackets indicate those series to be treated in other papers by the author.]

- 1a. Short-shoot leaves deeply lobed (LII \geq 35%); veins to sinuses always present.
 - 2a. Leaf blades 2–4 cm wide; lobes and sinuses triangular III. *Crataegus* ser. *Cordatae*
 - 2b. Leaf blades less than 2 cm wide; lobes and sinuses various.
 - 3a. Leaf blades $< 1.3 \times$ longer than wide, the sinuses narrow; bark rough, not exfoliating.
 - 4a. Inflorescences subglabrous; thorns indeterminate, often becoming branchlets; petals orbicular [I. *Crataegus* ser. *Crataegus*]
 - 4b. Inflorescences tomentose; thorns of determinate origin; petals elliptic II. *Crataegus* ser. *Apiifoliae*
 - 3b. Leaf blades $> 1.5 \times$ longer than wide, the sinuses relatively shallow and broad; bark smooth, exfoliating IV. *Crataegus* ser. *Microcarpae*
- 1b. Short-shoot leaves shallowly lobed (LII \leq 35%) or unlobed; veins to sinuses absent.
 - 5a. Fruit black or deep purple when fully ripe.
 - 6a. Short-shoot leaves unlobed; extension-shoot leaves usually deeply lobed, with veins to sinuses; petals turning orange with age; thorns ≤ 1.5 cm long, conspicuously recurved; fruit with a strong bluish bloom unless abraded; nutlets unspitted V. *Crataegus* ser. *Brevispinae*
 - 6b. Short-shoot leaves lobed or not; extension-shoot leaves not usually deeply

lobed, usually lacking veins to sinuses; petals never turning orange with age; thorns usually 1.5–4 cm long, slightly recurved to straight; fruit not usually so strikingly bloomy before full ripeness, when black to deep crimson-purple; nutlets usually laterally pitted

[*Crataegus* ser. *Douglasii*]

5b. Fruit usually red when fully ripe, occasionally greenish, yellow, orange, pink or purple (if pink, usually eventually becoming bright red underneath a bloom)

[all other North American *Crataegus* series]

II. *Crataegus* series *Apiifoliae* (Loudon) Rehder, Man. cult. trees Ed. 2: 367. 1940. *Crataegus* sect. *Apiifoliae* Loudon, Arbor. frutic. brit. 824. 1835–1838. TYPE: *Crataegus marshallii* Eggl.

Bushes or small *trees* usually 2–8 m tall; usually with crown of somewhat tabulate branches; *trunk* to 20 cm diam., usually much less, lacking branched thorns; bark grayish, flaking; thorny, with simple thorns. *Leaves* long-petiolate, small, broad-ovate to deltate in outline, deeply lobed with 3 or 4 main lobes each side; veins to major sinuses and lobes at wide (45°–70°) angle with midrib. *Inflorescence* many-flowered; pedicels pubescent; anthesis season mid-early. *Flowers* medium-sized; calyx lobes narrowly triangular, margins slightly lobed; petals elliptic; stamens 20, anthers red; styles 1–3. *Fruit* commonly 6 × 3 mm, ellipsoid to occasionally spherical, glossy, bright red, flesh mealy when ripe; *pyrenes* 1–3, convex dorsally.

One species, southeastern United States; widespread and common.

Crataegus ser. *Apiifoliae* has obvious similarities in the European series *Crataegus* in its distinctive leaf shape, relatively small flowers, and small and few-pyrene fruit. However, it differs from the latter series in only possessing fully developed thorns of definite growth. Differences from series *Crataegus* are sufficiently large to postulate a moderately long period of separation, a point of view also supported by fossil *Crataegus* materials from the Pacific Northwest Tertiary with somewhat similar foliage (e.g., Chaney, 1927). However, one cannot discount the alternative possibility of origin by mid-Tertiary long-distance dispersal of ancestral *Crataegus* with these leaf types across the Atlantic from Europe.

4. *Crataegus marshallii* Eggl., Rhodora 10: 79. 1908. *Mespilus apiifolia* Marshall, Arbust. amer. 89. 1785, non Medik., 1793. *Crataegus apiifolia* (Marshall) Michx., Fl. bor.-amer. Ed. 1. 1: 287. 1803. TYPE: Not located.

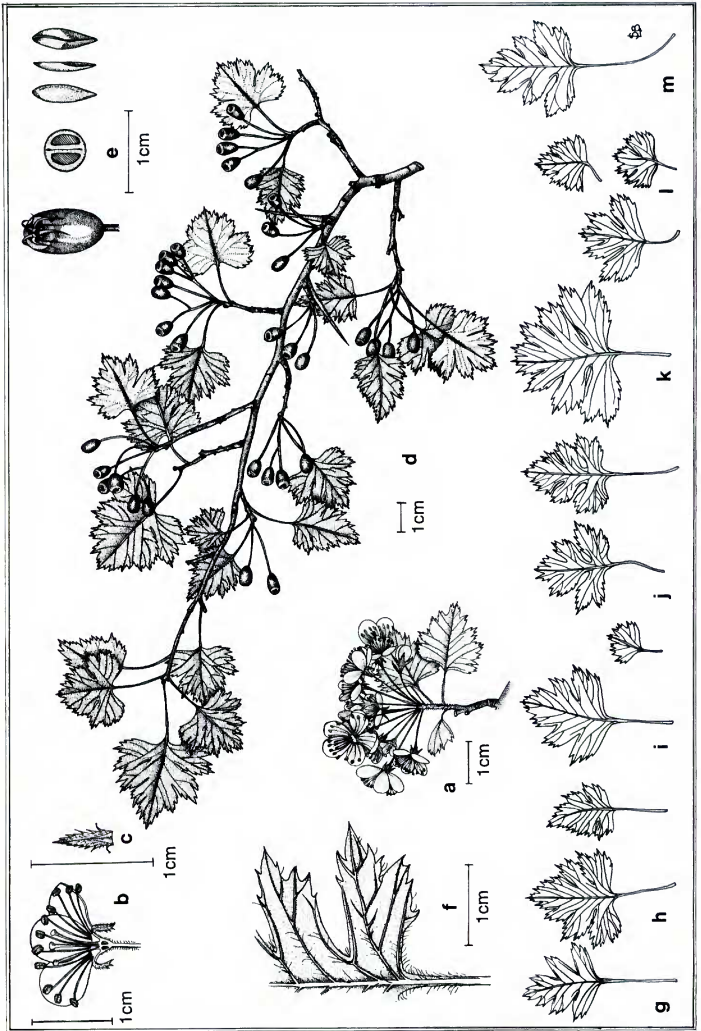
Parsley Haw. Figure 1.

Bushes or small *trees* usually 2–8 m tall, usually single trunked with larger specimens having a crown of somewhat tabulate branches; *trunks* to 20 cm diam., usually much less, lacking compound thorns; bark grayish, flaking; *branchlets* unarmed or sparsely to moderately thorny with usually simple thorns³; extending shoots densely appressed pubescent; 1-year-old shoots pubescent or glabrescent, gray-brown; older gray; thorns straight or slightly recurved, slender, (1–)2–3(–5) cm long. *Leaves* deciduous; petioles slender, 1–2 cm long, pubescent; blades small (1.5–3 cm long), broad-ovate to deltate in outline, densely pubescent on both sides when young, ± glabrescent with age except on the main veins below; deeply lobed with (2–)3 or 4(–5) main lobes on each side, sinuses often closed distally by overlapping lobe margins, the margins toothed; veins extending to major sinuses and lobes at a wide (45°–70°) angle with midrib. *Inflorescence* 3–8-flowered; pedicels very pubescent; anthesis mid-early. *Flowers* 12–17 mm diam.; hypanthium glabrous to slightly pubescent externally; calyx lobes 3–4 mm long, narrowly triangular, pubescent adaxially, glabrous abaxially, margins glandular-serrate; petals elliptic, commonly 6–8 mm long, white or very rarely pink; stamens 20, filaments ca. 7 mm, anthers red, 0.5 mm long; styles 1–2(–3). *Fruit* commonly 4–6 mm long, ellipsoid to occasionally spherical, glossy bright red (rarely dull orange) at maturity, flesh mealy when ripe; *pyrenes* 1–2(–3), convex dorsally.

One of the commonest of southern United States hawthorns, *C. marshallii* has a wide distribution from Arkansas to Virginia (Fig. 2) southward to eastern Texas and central Florida, with a few outliers in Oklahoma, southern Missouri, and southern Illinois. It is absent from the southern and eastern parts of Florida. It is found in a variety of open wooded habitats, in woodland openings and edges, successional habitats, fence lines, etc., although not normally in dense shade. It occurs both in quite wet and obviously well-drained soils. *Crataegus marshallii* is known to be hardy to USDA Zone 5, but this may not be true for all provenances. Flowering mostly late March to early April, but as early as mid-February in some seasons in central Florida.

Crataegus marshallii is the only representative of series *Apiifoliae* and as such is not very closely related to other native North American hawthorns

³ The young shoots are sometimes thorn-like but with small distal herbaceous appendages. These structures may either elongate or become true thorns.



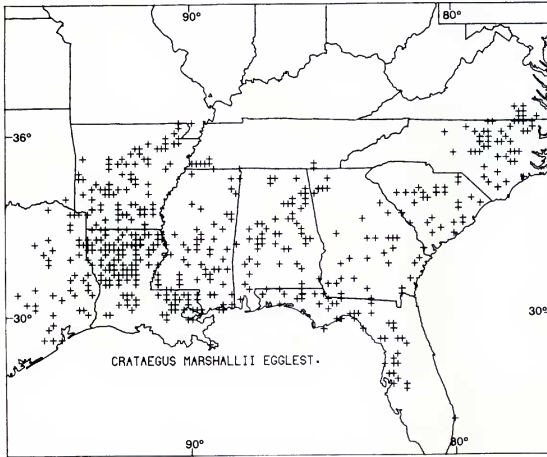


Figure 2. Distribution of *Crataegus marshallii*. Based on collated herbarium records for *The Vascular Flora of the Southeastern United States* (Cronquist, 1980) area; incomplete northward. + = exsiccatae seen by me, Δ = literature records.

(Phipps, 1983). I have been unable to access Humphrey Marshall's herbarium at West Chester University, West Chester, Pennsylvania, where there may be type material. However, there is no doubt that Marshall's protologue exactly fits the accepted concept of *C. marshallii* Eggl.

Variation in *Crataegus marshallii* is not sharply segmented into often readily identifiable local populations, as can occur in apomictic forms, and the species therefore appears to be sexual, although critical evidence is lacking. As a 20-stamen species, it is probably also diploid. Variation in length and density of foliar pubescence occurs, and there is substantial variation in plant size and habitat, which could well have a genetic base. There are also slight variations in leaf shape and size, especially in the sharpness of lobes and teeth and the relative width and depth of the sinuses, but this study did not detect infraspecific variants based on

any combination of such characters. Much of the variation in leaf shape can be found on one specimen, i.e., *Thieret & Williams 17369* (LAF) from Tangihapoa Parish, Louisiana. The elliptic petal shape of *C. marshallii* is quite unusual in *Crataegus*, as are the small anthers. A form with flowers turning pink at late anthesis has been discovered in northeastern Texas by the late Houston nurseryman Lynn Lowrey, and was being assessed for the retail trade.

Representative specimens examined. U.S.A. **Alabama:** Baldwin: Mobile, *Mohr s.n.* (MSC-43353, US). Calhoun: ca. ½ mi. NE of Nesbit Lake, *Morelle s.n.* (JSU-10086). Cherokee: county road 19, ca. 6.5 mi. S Centre, *Kral 34476* (TENN). Chilton: near Cadena, *Palmer 38920a* (A). Dallas: 1 mi. WNW Cahaba ravine, *Kral 45352* (VDB). Etowah: Attalla, *Anonymous H532* (A, US). Fayette: Mount Vernon, *Mohr s.n.* (A, US). Geneva: swamp of Choctawhatchee River, ca. 1.2 mi. NW of Highbluff jct., *Clark 7589* (NCU). Greene: 5 mi. SE from Eutaw by picnic area

Figure 1. *Crataegus marshallii*. —a-c. Inflorescence and flower parts from *Phipps 5318* (UWO). —d. Fruiting branch from *Phipps 5180* (UWO). —e. Fruit and parts from *Moreland 991* (NLU). —f. Leaf, abaxial surface from *Phipps 5180* (UWO). —g-m. Leaf variation from several sources (sequence from left to right): g, *Thieret & Williams 17286* (FSU); h, *Phipps 5180* (UWO); i, *Moreland 991* (NLU); j, *Phipps 5113* (UWO); k, *Phipps 5178* (UWO); l, *Phipps 5318* (UWO); m, *Thieret & Williams 17969* (USLH).

- of Lock 7. *J. L. Thomas et al. T1058* (NCU, UNA). Hale: by Co. road 10, at jct. Ala. 61, 9 mi. N of Uniontown, *Kral 45385* (VDB). Lee: Auburn, *Earle et al. s.n.* (GH, US). Lowndes: near Mt. Sinai Church on N side of Hwy. 6, *Phipps et al. 5318* (UWO). Marengo: right-of-way of Co. road 44, ca. 4 mi. E of Dayton, *Clark 13714* (NCU). Montgomery: along Alabama River, Montgomery, *Harbison 25* (A). Morgan: *Smith s.n.* (GH, US). Perry: 3.5 mi. E of Uniontown, *J. L. Thomas 1930* (NCU, NLU, UNA, USF). Pike: Conecuh R. bottoms by US 231, NW side Troy, *Kral 47327* (VDB). St. Clair: 2.5 mi. S Asheville on US 231, *Kral 30380* (GAM, VDB). Sumter: 6 mi. N of York, hwy. 17, RR crossing, Flatwoods region, *Jones 15548* (LSU, NCU, VDB). Tallapoosa: Concord Church and Cemetery area, 4.5 mi. N of Dadeville, *Rutland 1997* (AUA). **Arkansas:** Bradley: P.O. Warren, *Demaree 24819* (FSU, GH, NCU). Calhoun: P.O. Hampton, *Demaree 14403* (GH, MO). Clark: N side of I-40, rest area at Arkadelphia, *Phipps 5884* (UWO). Clay: Moark, *Palmer 4787* (A, MO, US). Cleburne: Heber Springs, *Palmer 6971* (A, MO). Columbia: P.O. Waldo, *Demaree 39231* (GH, NCU). Craighead: Crowleys Ridge, *Demaree 28795* (GAM, GH, NCU, NO). Desha: near Dumas, *Ashe s.n.* (NCU-8465). Drew: low hills, *Demaree 4376* (US). Faulkner: near Conway, *Palmer 26493* (A, MO). Franklin: lower end of Devils Hollow near Mill Creek, *Barber 583* (UARK). Garland: Lake Hamilton island, *Demaree 39481* (FSU, GH, NCU). Grant: banks of Saline River, *Demaree 16313* (A, MO, NO, WVA). Greene: P.O. Walcott, Crowleys Ridge State Park, *Demaree 27946* (GH). Hempstead: Fulton, *Bush 53* (MO). Hot Springs: Magnet Cove, *Palmer 26613* (A, UARK). Howard: Bakers Springs, *Kellogg 18* (A, MO). Independence: Batesville, *Palmer 29769* (A, MO, UARK). Jackson: Newport, *Letterman s.n.* (A). Lafayette: S of Walnut Hill, *Montz 4191* (LSU). Miller: Texarkana, *Bush 2226* (A). Montgomery: P.O. Hopper, *Demaree 55131* (USLH, WVA). Nevada: Prescott, *Bush 71* (MO). Ouachita: Twin Bayou bottoms, P.O. Camden, *Demaree 14417* (A, GH, MO, US). Pike: Rosboro, *Demaree 9473* (A, GH, MO). Polk: Hwy. 8 W from Mena, *Patterson 96* (UARK). Pulaski: behind the Little Rock University botany greenhouse, *Sinclair 1730* (NLU). Scott: near Upper Black Fork Basin of Poteau River, *Lynn s.n.* (UARK). St. Francis: N side of I-40, 2 km W of Ark. 78, *Phipps 5883* (UWO). Warren: Warren Prairie, *Kral 64781* (VDB). White: Bald Knob, *Anonymous H2863* (US). **Florida:** Alachua: Gainesville, *Murrill s.n.* (DUKE, GAM-2311, UWO). Calhoun: Chipola R., W of Blountstown, *Godfrey 63072* (FSU, MSC, USLH, VDB). Dixie: Old Town, *Harbison 5605* (A). Escambia: E edge of Bluff Springs, *Beekner et al. 1086* (DUKE, FLAS). Gadsden: River Junction, *Curtiss 5983* (DOV, GAM, FLAS, GH, MO, US). Gilchrist: ca. 7 mi. N of Fanning Springs, at the end of the road to Hart Springs, County Park, along the Suwannee River, *Hansen et al. 10838* (USF). Hernando: vicinity of Brooksville, *Jones s.n.* (US-1086801). Hillsborough: along Morris Bridge Road, *Coolley et al. 5857* (FLAS, USF). Jefferson: ½ mi. rise near Girardeau's Camp, *Exploration Party 1939* (FLAS). Leon: banks of Ochlochnee R., 10 mi. W Tallahassee, *Coker et al. s.n.* (NCU-77619). Marion: 10 mi. N of Ocala, *W. A. Murrill s.n.* (FLAS-43415). Suwannee: S of Luraville, *Arnold et al. s.n.* (FLAS-45214). Taylor: near Gulf Coast, *Harbison 10* (A). Wakulla: near Aucilla R. Rt. 9B, *Williams s.n.* (FSU-15214). **Georgia:** Baker: Flint River above junction with Ichawaynochaway Creek, *Thorne 7143* (GAM). Bartow: along S side of Green Pond 6.8 mi. 58° E of Adairsville, *Duncan et al. 12769* (GAM). Charl-
- ton: St. Mary's River at Traders Hill S of Folkston, *Duncan 1975* (GAM). Dodge: Ocmulgee River swamp along US highway 280, W of Rhine, *Bozeman 5472* (NCU). Emanuel: 1.3 km (0.8 mi.) S of Interstate Route 16 on US Route 1, *Wood et al. 4365* (CI). Floyd: Rome, *Anonymous B1436* (US). **Louisiana:** Caldwell: clay soil on hillside E of Copenhagen and La. 849 of the Ouachita River, Sec. 13, T12N, R. D. Thomas et al. 95071 (UWO). LaSalle: Northern half of Sec. 11 in old Bartram's Prairie, SW of U.S. 84 and SE of U.S. 165 S, R. D. Thomas 94590 (UWO). Orleans: New Orleans, *Drummond 105* (UWO). Union: closed Spencer School along road W of La. 143, R. D. Thomas et al. 87883, (USCH, UWO). Vernon: 6 mi. NW of Leesville, *Wolff s.n.* (MSC). **Mississippi:** Clay: Tibbee Creek bottoms S of West point, *McDaniel 2328* (IBE). Covington: 2.5 mi. W of Collins, *McDaniel 2960* (IBE). Forrest: NW Corner Marble St. and 39th Ave., Hattiesburg, *Woofer 2707* (FSU). Forrest & Lamar: Hattiesburg, *Harbison 36* (A). George: in White Bluff area of University of Mississippi, *Pullen 63159* (GAM, NCU). Greene Co.: roadside near McLain on US 98, *Phipps et al. 5337* (UWO). Grenada: 5 mi. W of Holcomb, *McDaniel 2340* (IBE). Harrison: Biloxi, *Seymour et al. 36* (DUKE, GH, MSC, NCU, NO). Itawamba: 17 mi. S of Belmont, Senter place, *Martin II-181* (IBE). Jackson: Ocean Springs, *Skehan s.n.* (MO). Lauderdale: Meridian, *Anonymous H4156* (US). Lowndes: Columbus, *Anonymous H4189* (US). Marion: at old Oxbow Lake along Pearl River at Columbia, Hwy. 98, *Jones et al. 6496* (GAM). Newton: 5 mi. W of Newton, Jackson Prairie Region, *Ray 7785* (FLAS, GH, NCU, USF). Oktibbeha: 15 mi. S of Starkville, Noxubee Game Refuge, *McDaniel 1687* (FSU, NO, UNA). Pearl River: Walkia Bluff, Pearl River ca. 8 mi. NW of Pica-yune, *Sargeant et al. 11389* (GAM). Simpson: Saratoga, *Trach 8697* (MO). Smith: Bienville National Forest ca. 6.25 mi. NE of Pineville, NE4 S22 ca. 0.5 mi. W of Co. Rd., *Mitchell 29* (IBE). Stone: 7 mi. E Wiggins, *Ray 7689* (FSU, NSU, USF, VDB). Wayne: Waynesboro, *Pollard 1224* (GH, MO, US). Wilkinson: N of Woodville near Doloroso, *Ray 7962* (GH). Winston: ca. 4.0 mi. NW of Louisville, *Smith 502* (UWO). **North Carolina:** Bladen: near Clarkton, *Anonymous 2091a* (US, MO). Cumberland: 2.8 mi. N of jct. US 301 and NC. 24 on river road, *Ahles 36666* (NCU). Durham: along Little Creek near NC 54, 2 mi. E of Chapel Hill, *Britt 1213* (NCU). Edgecombe: near Tar River 1.5 mi. NNE of Rock Mount, *Radford 32032* (NCU). Franklin: along Tar River, about 3 mi. E/SE of Bunn, *Ahles et al. 11388* (NCU, VDB). Granville: Camp Butler, *Batson 747* (DUKE). Halifax: phone line road at a point 0.2 mi. NE of intersection of 1327, *Wickland 1192* (NCU). Hertford: 3.3 mi. NNE of Union, *Ahles et al. 52351* (FLAS, NCU). Johnston: bank of Neuse R., Boone Twp. 9 mi. below Smithfield, *Fox et al. 1277* (GAM, GH, NCSC, TENN). Lenoir: bank of Neuse River, near Kinston, *Totten s.n.* (NCU). Northampton: 1.3 mi. NW of Bryantown, *Ahles 41875* (NCU, NCNU). Orange: US rte. 70 W of Linden Road, Hillsborough, *Boufford 12037* (CM). Pender: Cape Fear River above Holly Shelter Lodge, *Fox et al. 180* (NCSC). Wayne: close to Neuse R., *Phipps 5113* (UWO). Wilson: Contentnea Creek, near Rock Ridge, *Radford 40810* (NCU). **Oklahoma:** McCurtain: 10 mi. E of Idabel on Okla. 3, *City 144* (NLU). **South Carolina:** Bamberg: 5.1 mi. ENE of Ehrharot on County Rt. 21, *Ahles et al. 22221* (NCU). Barnwell: Sta. 64 of Atomic Energy Commission, Savannah River Operations Area, *Kelley et al. s.n.* (USCH). Berkeley: Wambaw Creek at highway bridge, 6 mi. NW of McClellanville, *Little 14337* (NCU). Charles-

ton: Ravenel, vicinity of Charleston, Bear Swamp, *Hunt 3189* (CLEMS, NCU). Chesterfield: highway between Cheraw and Society Hill, 2 mi. from Cheraw, *Coker et al. s.n.* (NCU). Colleton: 5 mi. S of Ruffin, on US 21, *Batson s.n.* (USCH). Darlington: slopes of Lynchess River W of Hartsville, *Smith 953* (NCU). Fairfield: ¾ mi. NE of Blairs, *Freeman 5675* (NCU). Florence: 4 mi. E of Olanta & S of Byrds Crossroads, *Bell 6090* (NCU). Jasper: 5.5 mi. S of US Rt. 321 on Co. Rt. 90, *Ahles et al. 10341* (FSU, GAM). Kershaw: S of Lugoff along US 601 about 1 mi. N of jet. with Co. Rt. 28-47, *Leonard 1261* (AUA, CLEMS, DHL, LYN, MARY, NLU, NO, TENN, UNA, USCH, VCU, WILLI, WVA). Lexington: Congaree River, West Columbia, *Radford 9022* (NCU). Marion: along Co. Rt. 49 ca. 15 mi. S of Britton Neck, *Bell 11033* (NCU). Orangeburg: 0.4 mi. N of jet. of Co. Rts. 164 & 42 on Co. Rt. 42 (S of Bowman), *Ahles et al. 21674* (NCU). Richland: Columbia, Bower's Beach, *Philson s.n.* (A, DUKE, USCH). **Tennessee:** Fayette: Creek bottom, shaded, 1.25 mi. WSW Mason, *Kral 19895* (VDB). Hamilton: Lookout Creek at base of Lookout Mtn. on or near Chamblin property, *Sharp et al. 15923* (TENN). Hardeman: Ames Plantation—1 mi. SW Ed. McKinney house, *Hebb 26958* (TENN). Shelby: bottoms of Wolf River, NE of Germantown *Sharp et al. 6592* (TENN). **Texas:** Anderson: 2.3 mi. NW of Palestine, *Shinners 12976* (SMU). Angelina: 6 mi. W of Lufkin, *Parks 8012* (TAEM). Bowie: N-side 1-20 5 km E of Texas 8, *Phipps et al. 5255* (UWO). Galveston: 1/2 mi. E of I.H. 4S, Dickinson, *Waller et al. 3370* (TEX). Grimes: on Rt. 30, 0.5 mi. E of Navasota R., *P. Fryxell 2883* (SMU, TEX, UWO). Hardin: SW of Kountze, *Lundell & Lundell 10900* (TEX). Harris: Buffalo Bayou, a mi. S of Memorial Drive, *Smith 35* (SMU). Henderson: off 175. NW of Poynor, *Lundell & Lundell 11111* (SMU). Jasper: about 8 mi. N of Jasper on US 96 r.h.s., *Phipps et al. 6074* (UWO). Lamar: 2.5 mi. W of Paris, *McVaugh 7144* (SMU). Madison: 3 mi. S of Normangee on Farm Rd. 39, *Clark 378* (TAEM). Nacogdoches: Nacogdoches, *Parks 28074* (TAES). Newton: 4 ¾ mi. S of Newton, along Big Cow Creek, *Cory 52598* (SMU, TEX, UWO). Polk: at edge of "Gumbo Glade," *Tharp et al. s.n.* (SMU). San Jacinto: mixed pine-hardwood forest around Double Lade campground, *Hartman 1171* (TAEM). Shelby: 7.7 mi. NW of Aiken, *Correll & Correll 29070* (TEX). Van Zandt: Silver Lake, *Reverchon s.n.* (SMU). **Virginia:** Dinwiddie: near Carson, *Fernald et al. 5793* (MO). Greensville: 1 mi. NW of Dahlia (near Pleasant Hill), *Mikula 8643* (WILLI). Southampton: near Branchville, *Heller 965* (A, MO). Sussex: along Nottoway R., SW of Homeville, *Fernald et al. 10280* (GH).

Putative hybrids:

Crataegus × *notha* Sarg., *J. Arnold Arbor.* 3: 9. 1922. TYPE: U.S.A. Arkansas: Hempstead Co., hills abt. 5 mi. NE of Fulton, 26 Sep. 1921, *E. J. Palmer 20646* (A) [suspected *C. marshallii* Eggl. × *C. brachyphylla* Sarg. (ser. *Molles*)].

Five specimens were known in 1922.

Crataegus lacera Sarg., *Bot. Gaz.* 33: 123. 1902. SYNTYPES: U.S.A. Arkansas: Fulton, 2 Oct. 1900, *C. S. Sargent s.n.* (A); 23 Apr. 1901, *W.*

M. Canby, B. F. Bush & C. S. Sargent s.n. (A); Aug. and Oct. 1901, *B. F. Bush s.n.* (A) [possibly *C. marshallii* Eggl. × *C. mollis* (Torr. & A. Gray) Scheele].

This rare taxon is more similar to *C. mollis* than is *C. xnotha*.

Neither of these putative hybrids has been observed since their original collections.

III. *Crataegus* series *Cordatae* (Beadle) Rehder, *Man. cult. trees* Ed. 2: 367. 1940. *Crataegus* [subgroup] *Cordatae* Beadle [without rank], in *Small, Fl. s. e. U.S. Ed. 1: 532. 1903. Crataegus* sect. *Cordatae* (Beadle) Eggl., in *A. Gray, B. L. Robt. & Fernald, Manual Ed. 7: 476. 1908. TYPE: Crataegus cordata* (Mill.) Aiton [= *C. phaenopyrum* (L. f.) Medik.].

Small trees, 4–8 m tall; trunks with branched thorns or unarmed, bark fibrous-shredding; young branches with simple thorns 2–5 cm long. Leaves ± glabrous, ± deltate, palmately 3–5-lobed, veins extending to sinuses. Inflorescence 20–30-flowered; anthesis season very late. Flowers small, glabrous; calyces triangular, small; petals small, circular; stamens 20, anthers ivory; stigmas, styles, and carpels 3–4. Fruits 5–8 mm diam., ± orbicular, glossy, vermilion; calyx remnants present; pyrenes 3, dorsally grooved.

One species, Missouri and Arkansas to North Carolina. Found in woodlands on moist soil, generally in moderate but not very heavy shade.

This distinctive series shows some relationships, as discussed at the beginning of this paper, to series *Microcarpae*, *Apiifoliae*, and *Virides* in its leaf venation and small fruits.

5. *Crataegus phaenopyrum* (L. f.) Medik., *Gesch. Bot.* 84. 1793. *Mespilus phaenopyrum* L. f., *Suppl. pl.* 254. 1782. TYPE: *Ehrhart s.n.* (holotype, GOET).

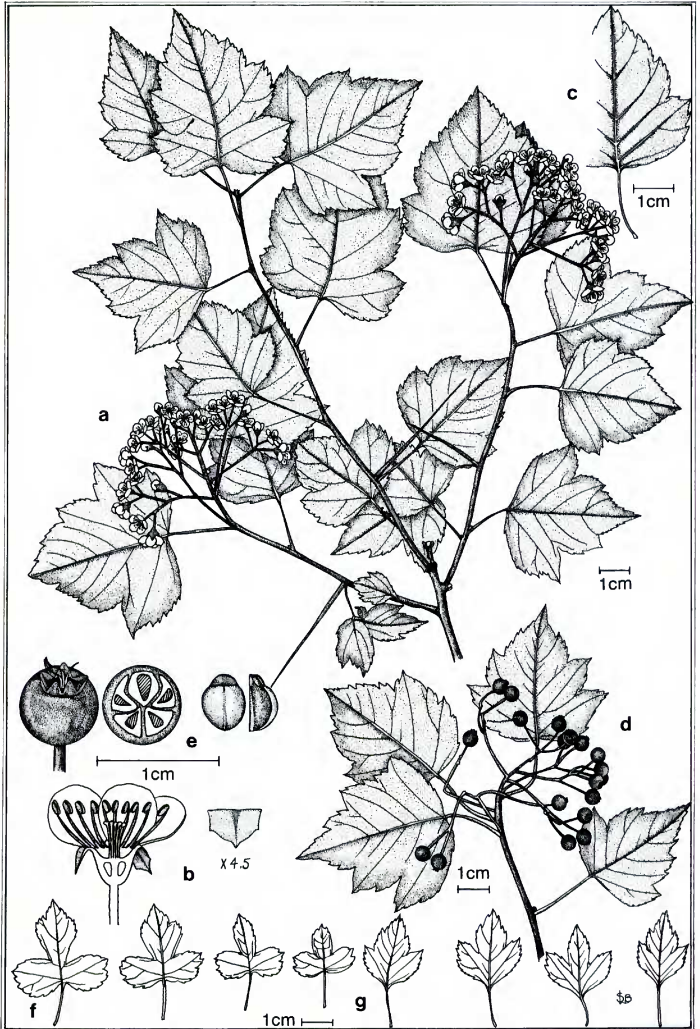
Mespilus cordata Mill., *Gard. dict.*, Ed. 8., 1768. *Crataegus cordata* (Mill.) Aiton, *Hort. kew.* 2: 168. 1789, nom. prop. rej. *Phaenopyrum cordatum* (Mill.) M. Roem., *Fam. nat. syn. monogr.* 3: 157. 1847. TYPE: tab. 179 in Mill., *Fig. pl. Gard. Dict. Ed. 1.*, vol. 2. 1760.

? = *Crataegus acerifolia* Lodd. ex Moench, *Verz. ausländ. Bäume* 31. 1785. *Mespilus acerifolia* (Lodd. ex Moench) Poir., in *Lam., Encycl.* 4: 442. 1798. TYPE: unknown.

Crataegus populifolia Walter, *Fl. carol.*: 147. 1788. TYPE: BM? (not seen).

Crataegus youngii Sarg., *J. Arnold Arbor.* 4: 105. 1923. TYPE: *Harbison 6028a* (holotype, A).

Washington Thorn. Figure 3.



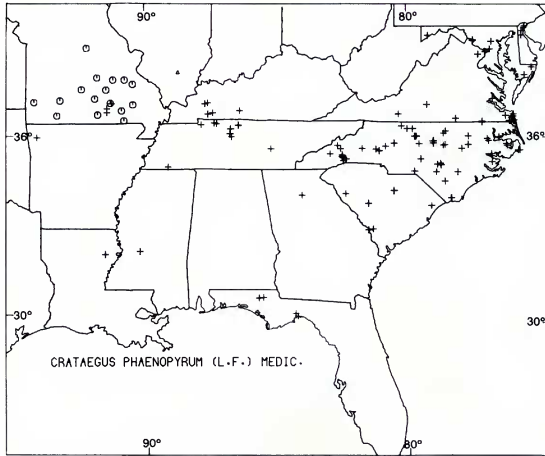


Figure 4. Distribution of *C. phaenopyrum* from collated herbarium records. Essentially complete for *The Vascular Flora of the Southeastern United States* area; incomplete northward. + = exsiccatae seen by me; Δ = literature records; octagon with re-entrant tail = Steyermark records, centered by county.

Small trees, 4–10 m tall, usually with a single trunk; trunks with compound thorns, bark fibrous-shredding; extending shoots subglabrous, becoming dark purple-brown; 1-year-old shoots deep purple or brown; older gray; young branches with simple \pm straight thorns 2–5 cm long. Leaves deciduous; petioles mainly 1.5–2.5 cm long, slender, glabrous; blades usually 3–6 cm long, broadly to narrowly deltate, \pm glabrous, palmately 3–5(–7)-lobed, sometimes very shallowly so, base truncate to more rarely cordate or cuneate, or leaves smaller and ovate in outline (but still lobed) in some plants from central North Carolina; veins extending to sinuses. Inflorescence 20–30-flowered; branches glabrous; anthesis very late. Flowers 10–12 mm diam.; hypanthium glabrous externally; calyx lobes broad-triangular, 2 mm long, margins entire, glabrous adaxially; petals circular, white; stamens 20, anthers ivory; styles 3(–4). Fruits numerous, globose, glossy, vermilion, 5–8 mm diam.; calyx remnants present or abscissile; pyrenes usually 3, dorsally grooved.

Occurring in a broad band from Missouri to North Carolina (Fig. 4), with outliers in all states southward except Alabama, from which earlier records (Clark, 1971) have proven to be vegetative *C. viridis*. Many other *Crataegus* species may possess, particularly in vegetative shoots, a more or less deltate leaf shape, and extreme caution is required in identifying such material. Possibly non-native in Delaware, D.C., and Maryland. Found in woodlands on rich soil, generally in moderate but not very heavy shade. Flowering very late, after all congeners.

This distinctive species shows some relationships to series *Microcarpae*, *Apiifoliae*, and *Virides* in its leaf venation and small fruit. The leaves of sprout shoots of *C. phaenopyrum* are often different from the mature leaves described above, tending to be both smaller and more bluntly lobed (Fig. 3, lower left). Also the terminal lobe is “waisted.” Forms differentiated as *C. youngii* Sarg. on the basis of an abscissile fruiting calyx and narrower and

Figure 3. *Crataegus phaenopyrum*. —a–c. Inflorescence, flower section and calyx lobe, and single leaf (upper right), from Barrous 2 (UWO). —d, e. Infructescence and fruit parts from Gattinger 803 (BM). —f, g. Variation in leaf shape is illustrated by: f, Godfrey 81202 (UWO), lower left; and g, Skean 377 (UWO), lower right. The Godfrey specimens are typical for sprout shoots, and the Skean specimen illustrates the “youngii” tendency (see text) with mature leaves.

smaller leaf blades cannot be sustained because of intermediates. These forms are found in central North Carolina, where they are quite common, with several records from Greensboro, Guilford Co., and Chapel Hill, Orange Co., as well as a few records from South Carolina and southern Virginia.

Crataegus phaenopyrum is an important woody ornamental valued for its tree-like habit, glossy, ivy-shaped leaves, fine fall color, and brilliant, persistent vermilion berries. It is widely cultivated in the central and northeastern United States and through the southern Great Lakes area. It is hardy to USDA Zone 5.

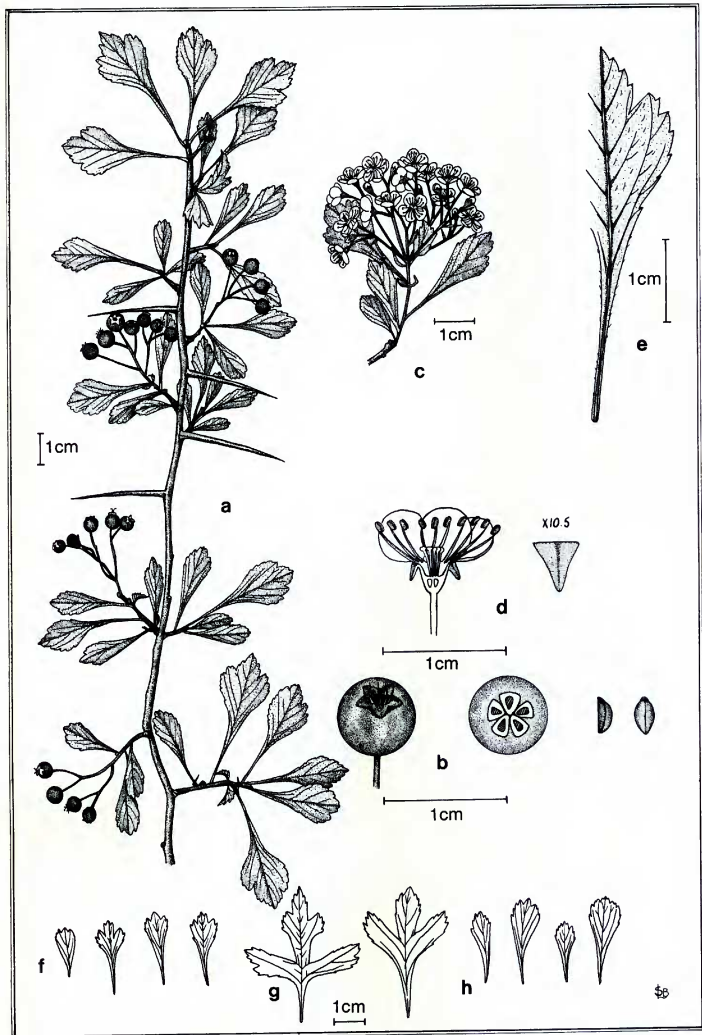
I have not considered the species *C. acerifolia* Lodd. ex Moench or *C. populifolia* Walter worth typifying. *Crataegus acerifolia* is usually considered to be a synonym of *C. phaenopyrum*, presumably on the basis of the name, and is therefore considered here for synonymy. However, Moench's herbarium no longer exists, and the protologue is poor and seemingly contradictory. Relevant detail, translated from the German (Moench, 1785), reads, "The trunk is 12 feet high and thornless. The leaves are alternate, round and of varying form, (the margins) deeply sawtoothed, . . . dark green and not shiny above, below pale green, somewhat hairy on both sides, 5 inches long and 4 broad. The petioles are 1½ inches long from which the leaves hang loosely. The 3-inch-long inflorescences. . . common flower stalks, which are hairy. . . . The five calyx lobes are lance-shaped, mostly with entire margins, and stand upright. The five petals are white, concave, oval and as long as the calyx lobes. Stamens 16–20, never more, white (e.g., filaments), as long as the petals. Anthers yellowish. Pistil is split into two diverging halves (= 2 styles?). Hypanthium is campanulate. Fruit red, ripening in October, the same size as round-leaved hawthorns, 2 pyrenes with compartments." About the only diagnostic points agreeing with *C. phaenopyrum* are leaf color, calyx margin, stamen number, and anther color. Leaf size, shape, inflorescence indumentum, and carpel number are different. The subequal calyx lobe and petal length are implausible as is the leaf size unless for sucker shoots. The deficiencies of the protologue are typical of the period. In the case of *C. populifolia*, the only *Crataegus* that could be found at HUH among the photostats of Walter's herbarium is *C. marshallii*, but the type description, though

brief, is pertinent. It reads, "With trilobed subcordate leaves, the lobes incised-serrate, smooth on both sides, with long smooth petioles." *Crataegus phaenopyrum* is so distinct a species that this diagnosis probably applies. Neither of these names has any modern currency.

The name *Crataegus phaenopyrum* has been regularly in use on this continent for the Washington Thorn since Eggleston (1908) argued that Aiton's *C. cordata* (1789) represented another species, perhaps of series *Tenuifoliae*. Aiton's *C. cordata* is based on Philip Miller's *Mespilus cordata*, illustrated (tab. 179) and described in his *Figures of Plants*. . . (1760). This illustration, however, does not compare very well with *C. phaenopyrum*, the flowers being too large, and having 10 instead of 20 stamens. In addition, the toothing of the leaf margins is stronger than is normal for *C. phaenopyrum*. It is clear that the illustration is somewhat inadequate for *C. phaenopyrum*. On the other hand, the deltate leaf of the illustrated specimen does indeed resemble that of *C. populnea* Ashe or *C. iracunda* Beadle (both of ser. *Silvicolae*), and the fairly large flowers are in line with this. These taxa would have fallen within Eggleston's view of series *Tenuifoliae*. However, the illustrations are also somewhat poor for the two last-mentioned species and also Miller explicitly stated that his *Mespilus cordata* flowered in late June, which is so late as to definitely exclude series *Tenuifoliae* (sensu Eggleston) by a good month. It is clear to me that the identity of Philip Miller's *Mespilus cordata* is unknowable with any certainty, on present knowledge of American hawthorns, unless one were to embark on the arbitrary process of epitypification. Consequently, I have submitted a proposal to reject the name *Crataegus cordata* (Mill.) Aiton.

Representative specimens examined. U.S.A. **Arkansas:** Washington: river banks, NW area, *Harvey s.n.* (UARK). **Delaware:** New Castle: hedgerows and fields, *Canby 36* (CM, DOV, GH). **Florida:** Wakulla: Wakulla Springs along Wakulla R., *Palmer 38573* (A, MO), Washington: rd. C-280 about 2 mi. from its jct. with C-277, *Godfrey et al. 81275* (FLAS). **Georgia:** Gwinnett: from Buford to Cumming just E of bridge, Chattahoochee River, *Duncan 3604* (GAM). **Kentucky:** Christian: along small streams, Hopkinsville, *Palmer 17648* (A). **Maryland:** College Park Campus, *Hayden 235* (MARY). Frederick: along stream off Garfield Rd. 1 mi. from Rt. 153, N of Wolfesville, *Norris 364* (CM). Worcester: roadside 5 mi. NE of Pocomoke City on Rt. 113, *Tatnall 1822* (COV). **Mississippi:** Hinds:

Figure 5. *Crataegus spathulata*. —a, b. Infructescence and fruit parts from *Phipps 5282* (UWO). —c–e. Inflorescence, flower parts, and magnified leaf from *Phipps 5174* (UWO). —f–h. Range of short-shoot leaves from: f, *Phipps 5303* (UWO); g, two deeply lobed long-shoot leaves from *Phipps 5174* (UWO); h, *Thomas et al. 82031* (UWO).



Jackson, *Harbison 6051* (NCU). **North Carolina:** Beaufort: 3 mi. SE of Aurora, *Blair 665* (NCSC). Buncombe: low grounds, Biltmore, *Anonymous 333b* (NCU). Catawba: Lyle Creek, between Newton & Statesville, *W. C. Coker s.n.* (NCU-77650). Chowan: 1.7 mi. ESE of Yeoplin in the vicinity of Middleton Creek, *Ahles et al. 51082* (GAM). Cumberland: Methodist College Campus, *Crutchfield 5600* (AUA, CM, DHL, FLAS, KY, LYN, MARY, NCU, NO, UNA, USLH, WILLI, WVA). Davie: near foot of hill, W of Bear Creek on Statesville road near Mocksville, *Totten* (NCU). Durham: swamp of New Hope Creek by Chapel Hill-Raleigh Rd., *Totten 1* (NCU). Guilford: near SW limits of Greensboro, NW corner of intersection of I-95 and E Lee Rd., *Phipps 5120* (UWO). Henderson: NW of US, 6 5/4 mi. NE of Hendersonville, *Pitillo 115* (FSU, KY, NCU). Iredell: Statesville, *Patterson s.n.* (MSC-43895). Orange-Durham: Chapel Hill, swamp of Bowlines' Creek near Hancock's bridge, *Totten s.n.* (NCU). Tyrrell: by roadside canal, 5 1/2 mi. W of Sandy Point Landing, *Fox et al. 4463* (NCSC). Wilson: near Contentnea Creek, 2 mi. E of Black Creek, *Radford 35682* (NCU). **Ohio:** Hamilton: near a park in Glendale, *Adams 81* (KY). Warren: Bowling Green-southern, *Price s.n.* (A). **Tennessee:** Davidson: around Nashville, *Gattinger sub Curtiss 803* (BM).

IV. *Crataegus* series *Microcarpae* (Loudon) Rehder, *Man. cult. trees*, Ed. 2: 367. 1940. *Crataegus* sect. *Microcarpae* Loudon, *Arbor. frutic. brit.* 825. 1835-1838. TYPE: *Crataegus microcarpa* Lindl. (= *C. spathulata* Michx.).

Small tree to 7 m or bush, often with very tabulate branching when open grown; main trunk erect, bark smooth with thin flakes, cream to cinnamon-brown or light gray-brown in patches; thorns simple, abundant to few, straightish, of medium length, 3-4(-5) cm long, blackish. Leaves barely petiolate; blades small, coriaceous, long-persistent, lobed, somewhat glaucous, glabrous; those on short shoots elliptic to obovate, lobes 2-3, acute to rounded, LII about 5% to 30%, veins extending to sinuses, those on rapidly elongating shoots generally more diverse in shape, more deeply lobed and larger. Inflorescence multi(20-30)-flowered, glabrous; anthesis late. Flowers small; calyx short-triangular; petals small, circular, white; stamens 20, anthers pale yellow; styles 3-5. Fruit small, 3-5 mm diam., globose, often numerous in a corymb, bright orange-red with 3-5 pyrenes obscurely dorsally grooved, their top quarters exposed.

One species, common and widespread in the southeastern United States, west to Texas.

6. *Crataegus spathulata* Michx., *Fl. bor.-amer.* Ed. 1: 288. 1803. *Mespilus spathulata* (Michx.) Poir., in Lam., *Encycl.*, suppl. 4: 68. 1816. TYPE: U.S.A. North Carolina: *Michaux s.n.* (P photostat).

Crataegus microcarpa Lindl., *Bot. Reg.* 22: t. 1846. 1836. TYPE: U.S.A. *Lindley s.n.* (CGE not seen).

Littlehip Hawthorn. Figure 5.

Small tree to 7 m or bush, often with very tabulate branching when open grown. Main trunk usually erect; bark smooth with thin flakes, greenish when younger, then cream to cinnamon-brown or light gray-brown in patches; branchlets with extending shoots pubescent or glabrous, becoming dull reddish; 1-year-old shoots dull gray; older gray; thorns simple, abundant to few, straightish, of medium length, 3-4(-5) cm long, blackish. Leaves deciduous; petioles ± lacking; blades 1.5-3 cm long, ± coriaceous, long-persistent, lobed, somewhat glaucous; those of short shoots elliptic to obovate, narrowly cuneate below, lobes usually 0-2 per side, acute to rounded, LII about 5% to 30%, veins extending to sinuses, if present, those on rapidly elongating shoots generally more diverse in shape, more deeply lobed and larger; glabrous abaxially; adaxially somewhat hairy above especially near the midvein, becoming glabrous; rarely overall pubescent. Inflorescence multi(20-30)-flowered; branches glabrous; anthesis medium-late. Flowers ca. 10 mm diam.; hypanthium glabrous; calyx lobes broad-triangular, 1.5-2.0 mm long, subtire, adaxially and abaxially glabrous; petals 4-5 mm long, ± circular, white; stamens 20, anthers usually pale yellow, anthers 0.5 mm long; styles 3-5. Fruit ca. 3-5 mm diam., globose, often numerous in a corymb, bright red or orange; calyx present, lobes reflexed; pyrenes 3-5, obscurely dorsally grooved.

South-central Texas to northern Florida and north to Arkansas and Virginia (Fig. 6). A distinct and locally common species of the south, but hardly recorded from Mississippi. The fairly high frequency of collection overall for *C. spathulata* suggests that this Mississippi gap is not a collection artifact but has natural causes in which case the hypothesis may be entertained that the separate eastern and western populations derive from different Pleistocene refugia. Woods, fence-lines, and brushy places, on a variety of soils, apparently relatively heliophilous.

Crataegus spathulata exhibits considerable variation in leaf shape and fruit color. In addition, rare forms possess quite pubescent foliage. It appears to be most closely related to *C. phaenopyrum* (ser. *Cordatae*) and is possibly related to *C. viridis* (ser. *Virides*). It is very easily recognized. This is the only species of *Crataegus* known to the author regularly possessing such strikingly thin, flaking outer bark, a characteristic by which it may be easily recognized even in winter. However, *C. viridis* L.

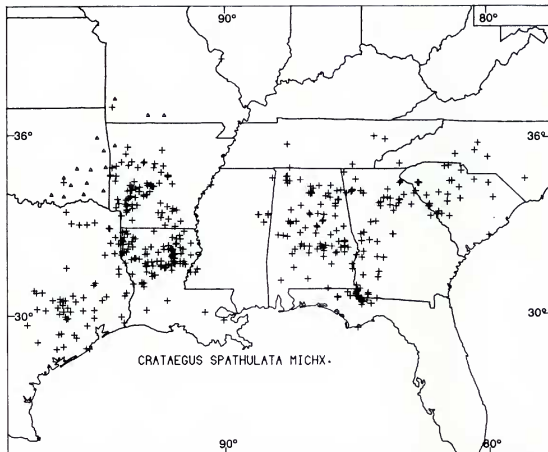


Figure 6. Distribution of *Crataegus spathulata* from collated herbarium records. Nearly all records seen for *The Vascular Flora of the Southeastern United States* area; inexact northward. + = exsiccatae seen by me; Δ = literature records.

also possesses this feature in a less marked degree. The chromosome number is not known, but the variation pattern suggests that *C. spathulata* is mainly a sexual diploid.

Representative specimens examined. U.S.A. **Alabama:** Autauga Co.: Prattville, *Smith 444* (UNA). Bullock: ca. 4.5 mi. NW of Union Springs, *Clark 16384* (NCU). Cherokee: county road 18, ca. 1–3 mi. N of Calhoun-Cherokee county line, *Whetstone et al. 12239* (JSU). Colbert: ca. 3 mi. E of Littleville, in upper portion of Rosebud Hill, *Webb 4979* (TENN, UWO). Cullman: covering low banks, *Mohr s.n.* (A). Dallas: near Selma, *Palmer 38917* (A, MO). DeKalb: Al. 35, ca. 2 mi. N of junction of Little River, R-O-W under power line, *Whetstone et al. 13122* (JSU). Elmore: Wetumpka, *Churchill 73-42788* (MSC). Greene: Warrior River by Ala. 14, ca. 4.2 mi. E of Eutaw, *Kral 46853* (VDB). Jefferson: Birmingham, *Harbison 25* (A). Lee Co.: Auburn, *Earle et al. s.n.* (MO-1917666, NCU, US). Lowndes: US 80, 14 mi. E of Dallas County line, *Kral 55038* (VDB). Macon: 2 mi. S of Hardaway, *Grant 087* (AUA). Marshall: along Short Creek, *Clark 12094* (UNC). Montgomery: 2 mi. S of Sellers, *Utal 10972* (NCU). Shelby: Oak Mountain State Park, towards the summit of mountain, *Kral 41513* (VDB). Talladega: on Ala. 76, just E of Childerburg, location "Coosa Pines," *Phipps 5488* (UWO). Tuscaloosa: 11 mi. S of city of Tuscaloosa, *Cooley et al. 3595* (USF). **Arkansas:** Ashley: P.O. Mist, *Demaree 14703* (GH). Bradley: P.O. Warren, *Demaree 24836* (GH). Calhoun: P.O. Hampton, Champagnolle Bayou Bottoms, *Demaree 16861* (TENN). Clark: between Gum Springs and Hollywood, *Phipps et al. 5244*

(UWO). Drew: P.O. Wilmar, *Demaree 24109* (FSU, GH). Garland: Rifes Landing, P.O. Lake Hamilton, *Demaree 39443* (GH). Hempstead: Tokio, *Demaree 10048* (GH, MO). Hot Springs: P.O. Magnet Cove, *Demaree 124854* (GH). Howard: 5 mi. SE of Mineral Springs (ca. 35 mi. NNW of Texarkana), *Itlis et al. 684* (UARK). Miller: Texarkana, *Pringle s.n.* (GH). Montgomery: vicinity of Housley Point on Lake Ouachita National Forest, ca. 10 mi. E of Mount Ida, *Thieret 18216* (FSU, USLH). Pike: Murfreesboro, *Demaree 9963* (Cl. GH). Pulaski: P.O. Natural Steps, Maumelle Mountain, *Demaree 8560* (A, GH, MO, NCU). Scott: P.O. Mansfield, *Demaree 18166* (MO). Sebastian: near Hartford, *Palmer 39328* (A, MO, US). Sevier: P.O. Ben Lomond, *Demaree 41649* (GH). Yell: on Lower road 10 mi. SW of Dardanelle, *Henbest s.n.* (UARK-36275). **Florida:** Gadsden: River Junction, *Curtiss 5989* (DOV, FLAS, GAM, GH, MO, NCU, US). Jackson: ca. 9 mi. NW of Marianna, *Godfrey et al. 54275* (FSU, DUKE, NCSC). Liberty: Torreya State Park, *Baker s.n.* (FSU). **Georgia:** Barrow: Gay's Aeres, *Morgan 38* (GAM). Clarke: Athens, Agricultural Campus, *Miller E3281* (UNA). Columbia: S of eastern summit of Rosemont Mountain, *Duncan 28969* (GAM). Decatur: 1 mi. N of Chattahoochee, *Muenschner et al. 3077* (MO). Dougherty: along Flint River at Albany, *Small s.n.* (A, US). Dade: on Sand Mountain 4.1 mi. W 6°S of Trenton, *Whetstone 96* (GAM). Early: between Saffold and the Chattahoochee River, *Godfrey 79085* (FSU, MISSA). Floyd: Horseleg Mtn., *Phipps 5303* (UWO). Gwinnett: Yellow River Valley, near McGuire's Mill, *Anonymos 2095* (A, GH, NCSC, US). Hall: E of Gainesville by 7 mi., *W. H. Duncan 3232* (GAM). Harris: Blackman Place near Cataula just S of Ossaahatch-

ie Creek, *Jones et al.* 22322 (FLAS, GH, USF, VDB). Madison: 4 mi. E of Danielsville, *Hume s.n.* (DUKE, FLAS). Meriwether: near Durand, *Jones 20941* (UNA, WVA). Richmond: Augusta, *Harbison 6080* (A). Seminole: N side Ga. route 91 of Chattahoochee R., *Phipps 5225* (UWO). Stephens: Currahee Mountain off Ga. route 23—U.S. route 123, *Boufford et al.* 17745 (CI, MO, NCU). Sumter: near Flint R., *Harper 628* (GH, MO, US). Talbot: 3 mi. SE of Talbotton, *Duncan 5124* (GAM). Walton: 8 mi. E of Monroe, *Wiegand et al.* 1377 (GH). **Louisiana:** Bossier: 2.5 mi. NW of Plain Dealing, *Allen et al.* 8039 (DUKE, FSCL, GAM, NCU, NO, USLH, WVA). Caddo: Jack Price residence N of Blanchard-Shipp Road. W of Blanchard, *R. D. Thomas et al.* 41810 (NLU). Calcasieu: along the Calcasieu River, *Nogle s.n.* (USLH). Caldwell: hills N of Copenhagen, E of La. 849, *R. D. Thomas et al.* 35884 (NLU). Catahoula: woods beside La. 124, 3 mi. W of Duty Ferry, *R. D. Thomas et al.* 43282 (NLU). DeSoto: 3.2 mi. S of US 84, S of Logansport, *R. D. Thomas et al.* 68418 (NLU), *D. Dixon 2088* (NLU). Grant: roadside of Bear Creek Rd., Parish road 521, *Parker 88* (NLU). LaSalle: SW of US 84 and SE of US 165 SW of Tullos, *R. D. Thomas 94592* (TENN, UWO). Morehouse: Spyker Estate, *Crow et al.* 551 (NLU). Natchitoches: Natchitoches, *Bush 5442* (CI, US). Ouachita: W of La. 557 between Cypress Creek and Caldwell Parish line, *R. D. Thomas et al.* 93836 (UWO). Red River: E of Coushatta, *R. D. Thomas 45635* (NLU). Richland: Alto, *R. S. Cocks 22* (A). Winn: Kisatchie National Forest, *Kessler 1213* (NLU). **North Carolina:** Macon: Clar Creek section, on Highlands-Walkkalla road, *Wright s.n.* (NCU-11425). Montgomery: E of Narrows Dam on Yadkin River 2 mi. NW of town of Uwharrie, *Wells 3048* (NCU). Rowan: *Small et al.* 47 (US). **South Carolina:** Aiken: roadside clearings along Co. Rt. 66, vicinity of jet. of Co. Rt. 103 and Co. Rt. 47, *Leonard et al.* 4943 (CLEMS, MO, NCU, NLU, VCU). Anderson: Anderson, *Davis 198* (CI, NCU, US). Cherokee: SE of Gaffney, *Ahles et al.* 26959 (NCU, USF). Chester: where SC 72 crosses Broad River, *Phipps 5124* (UWO). Henderson: *Davis s.n.* (CI-245197). Lexington: vicinity of Batesburg, *McGregor 107* (US). McCormick: dry pine-oak ridge 1 mi. NE of the Savannah River on S.C. 28, *Bozeman et al.* 8845 (AUA, CI, DHL, FLAS, FSU, GAM, KY, LYN, MARY, NCU, NO, TENN, UNA, USCH, USLH, UWO, VDB, WILLI). Newberry: 3 mi. NW of Chappels, *Bell 9184* (NCU). Richland: old Salada Dam near Columbia, *Coker s.n.* (NCU-83574). **Tennessee:** Knox: Knoxville, *Bright 13283* (CI, UWO). **Texas:** Brazos: Bryan, *Anonymous H8076* (US). Fort Bend: few mi. WSW of Rosenberg and 1 mi. E of 541 exit, *Phipps et al.* 6083 (UWO). Harris: ENE of Huffman on F.M. 1960, *Phipps et al.* 6067 (UWO). Hopkins: 7 mi. W of Sulphur Springs, *Shinners 13045* (GAM, SMU). Newton: Saw Mill Road about 1.5 km W of Saw Mill Town, *Phipps et al.* 6078 (UWO). Shelby: 7 mi. S of Center, *Shinners 18463* (SMU). Trinity: *Chambers s.n.* (TEX). Walker: 33 on Nature Trail, Huntsville State Park, *Mahler 8926* (SMU, UWO).

V. *Crataegus* series *Brevispinae* (Beadle) Rehder, *Man. cult. trees*, Ed. 2: 366. 1940. *Crataegus* [subgroup] *Brevispinae* Beadle [without rank], in *Small, Fl. s. e. U.S. Ed. 1*: 532. 1903. *Crataegus* sect. *Brevispinae* Beadle ex C. K. Schneid., *Ill. Handb. Laudbolzhk.* 1: 791. 1906. TYPE: *Crataegus brachyacantha* Sarg. & Engelm.

Bush to medium-sized tree, commonly 6–10 m tall; trunk with plated grayish bark, when older with branched thorns; branches thornless to thorny, thorns short, recurved, usually < 1.5 cm long. Leaves deciduous, short-petiolate; blades coriaceous and shiny, those of spur shoots small (ca. 2 cm) elliptic, crenate-margined, of elongation shoots often much larger (> 6 cm) and variously lobed, sometimes to the sinuses. Inflorescences with 15–25 flowers; branches glabrous; anthesis mid season. Flowers small, calyx lobes small; petals small, white until old; stamens 20, anthers cream; styles 4–5. Fruit ± globose, mealy, black to bluish black, usually with a heavy, waxy bloom at maturity; pyrenes 5, with slight dorsal grooving.

One species, Louisiana and neighboring states, disjunct in Georgia.

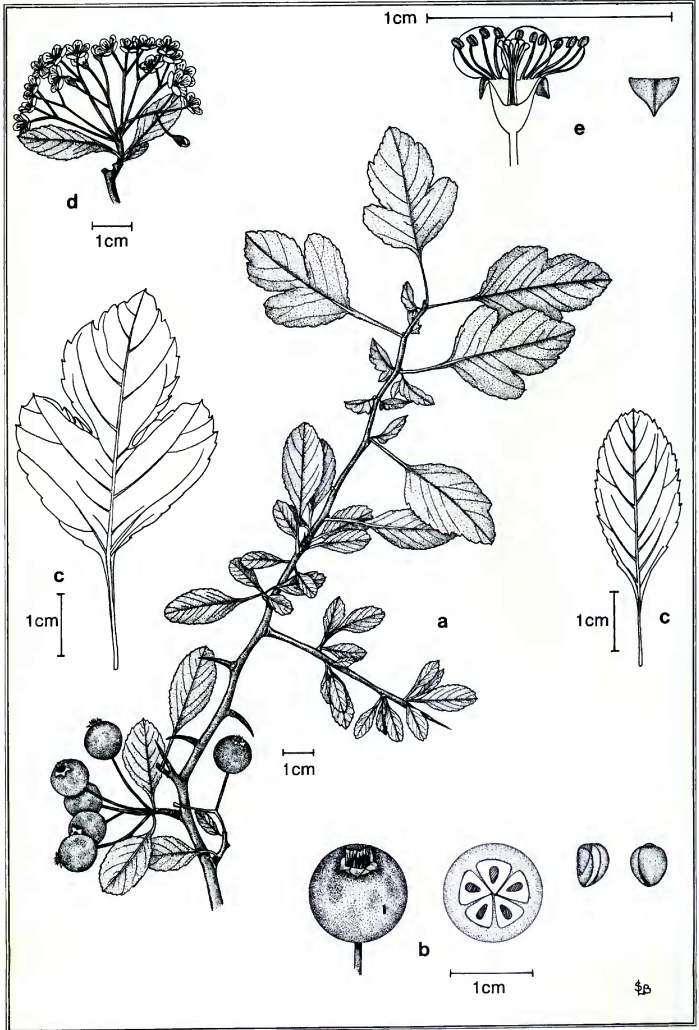
A very distinct series on account of its unusual, short, recurved thorns, very large plant size in some specimens, glossy leaves, among the smallest flowers in the genus, turning orange with age, and black fruit. The limited distribution range is remarkable and difficult to account for.

7. *Crataegus brachyacantha* Sarg. & Engelm., *Bot. Gaz.* 7: 128. 1882. TYPE: U.S.A. Texas: Longview, 19 Aug. 1882, G. W. Lettermann s.n. (lectotype, here designated, A).

Blueberry Haw, Hoghaw, Pomette Bleue. Figure 7.

Bush to medium-sized tree commonly 6–10(–15) m tall; trunk with plated gray bark; thornless to thorny, thorns short, recurved, usually < 1.5 cm long or branched on larger trunks. Leaves deciduous; petioles 3–8 mm long, glabrous; blades coriaceous and shiny, those of spur shoots 2–3 cm long, elliptic, unlobed, crenate-margined, those of vegetative shoots often much larger (> 6 cm long) and variously lobed, sometimes to the sinuses. Inflores-

Figure 7. *Crataegus brachyacantha*. —a–c. Fruiting branch and infructescence, fruit parts, and leaves from *Duncan & Duncan 4128* (DUKE). —d, e. Inflorescence and flower section with calyx lobe from *J. C. Chaffe s.n.* (DOV).



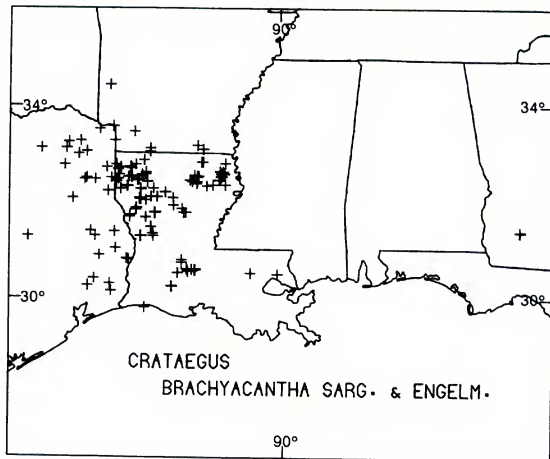


Figure 8. Distribution of *Crataegus brachyacantha*; main range essentially complete from collated herbarium records, somewhat incomplete for Texas.

cences with 15–25 flowers; branches glabrous; anthesis mid season. *Flowers* 7–9(–11) mm diam.; *hypanthium* glabrous externally; *calyx lobes* 1.5 mm long, triangular, margins entire, glabrous adaxially and abaxially; *petals* ca. 3 mm, circular, white until old; *stamens* 20, anthers cream, 0.5 mm; *styles* 4–5. *Fruit* ± oblate, 8–14 mm diam., flesh mealy, black to bluish black, with heavy, waxy bloom before maturity; *calyx* remnants erecto-patent to obsolete; *pyrenes* 4–5, with slight dorsal grooving.

The distribution of *Crataegus brachyacantha* is centered in Louisiana, where this species is locally common. It is also found in southeastern Oklahoma, eastern Texas, southern Arkansas, and southwestern Mississippi. A disjunct population has been collected from Georgia (Fig. 8), but specimens from there cannot be found now. Although *C. brachyacantha* has often been reported as a tree of wet prairies, alluvial flats, etc., I have frequently seen it, though generally as a smallish tree, on well-drained mesic sites in various parts of its natural range. This species is seemingly more shade-tolerant than many species of hawthorn. It flowers during mid season.

Crataegus brachyacantha is a very distinct species; the flowers turn orange with age or on drying, and are remarkable in this respect. The short, re-

curved thorns and bitter, oblate, black fruits are also distinctive. A very heavy bloom on the somewhat immature fruit, when the skin is purplish, gives rise to a bluish appearance and also to two of the common names. However, the fruit is nearly always full black at maturity. The fall foliage, brilliantly colored lustrous orange, bronze, and red, suggests potential ornamental use. The frequently deeply lobed leaves with veins to their sinuses on elongating shoots constitute a presumptively ancestral character that helps relate *C. brachyacantha* as well as such groups as series *Virides* to the other species treated in this paper. This species may be the tallest species of hawthorn in the United States.

According to Sargent (1890), *Crataegus brachyacantha* is not hardy in the north. The chromosome number is unknown.

Crataegus brachyacantha f. *leucocarpa* Sarg. (J. Arnold Arbor 3: 10, 1922) is a white-fruited form that was collected at Nachitoches, Nachitoches Parish, Louisiana, in September 1915 (Palmer 8719, A). The holotype is the only known collection of this forma.

Representative specimens examined. U.S.A. **Arkansas:** Ashley: P.O. Crosssett, 160 ft., *Demaree* 22033 (A, MO). Little River: Ashdown, *Palmer* 8386 (A). Miller: Texarkana, *Palmer* 22459 (A, MO, UARK, US). **Georgia:** Bak-

er: 4 mi. N of Newton, *Duncan & Duncan 4128* (A, DHI., DUKE, FLAS, GAM, NCS, NCU, US). **Louisiana:** Bienville: off Louisiana 4, ca. 2 mi. W of Friendship, *Robinette 212* (NO). Caddo: ca. 4 mi. N of Keatchie, *Thieret 22549* (USLH). DeSoto: ca. 1 mi. E of Naborton, ca. 8 mi. E of Mansfield, *Thieret 27468* (DUKE, FSU, GAM, USLH). Franklin: Murphy Woods property S of Old Mixon School S of La. 132 and NW of Archibald, *R. D. Thomas et al. 88742* (UWO), *7032* (UWO). Nachitoches: Nachitoches, *Cocks s.n.* (A). Ouachita: cultivated, Purchase Gardens & Zoo, Monroe, *R. D. Thomas et al. 30771* (NLU). Richland: E of La. 17 and S of La. 877 and Mitchiner, *R. D. Thomas et al. 59400* (NO, NLU, LSU), *1864* (LSU). Sabine: Toro, *Demaree 48200* (NCU, NO, UWO). St. Landry: Opelousas, *Mohr s.n.* (US-139229). St. Tammany: Glen Gordon, Covington. *Cocks s.n.* (A, NO). Webster: Lake Bistineau State Park campground ca. 8 mi. NW of Ringgold, *Thieret 26621* (DUKE, FSU, GAM, USLH). West Carroll: N of La. 134 at curve E of Little Coleau Creek 4 mi. W of Epps, *R. D. Thomas 84381* (NLU). **Texas:** Franklin: 10 km SE of Mt. Vernon, Farm Road 21, *Phipps et al. 5260* (UWO). Liberty: on FM 162, about 5 mi. E of Moss Hill & W of Batsford, *Phipps et al. 6069* (UWO). Smith: C. C. McDonald Farm, along Bedsprings Rd. in area "B," NE side of Lake Tyler East, ca. 2 mi. SW of Swinneytown, *Wilkinson 360* (SRH). Wood: near Longview, NE Texas, *Letterman s.n.* (A, MO, UWO).

Literature Cited

Aiton, W. 1789. *Hortus Kewensis*. George Nicol, London.
Chaney, R. W. 1927. Geology and paleontology of the Crooked River Basin, with special reference to the Bridge Creek flora. Pp. 45-122 in R. Kellogg et al. (editors), *Contributions to Palaeontology from the Carnegie Institute of Washington*. Additions to the Paleontology of the Pacific Coast and Great Basin Regions of North America IV. Carnegie Institute of Washington, Washington, D.C.

Clark, R. C. 1971. The woody plants of Alabama. *Ann. Missouri Bot. Gard.* 58: 99-242.
Cronquist, A. 1980. *Vascular Flora of the Southeastern United States*, Vol. 1. Univ. North Carolina Press, Chapel Hill.
Eggleson, W. W. 1980. The *Crataegi* of the northeastern United States and adjacent Canada. *Rhodora* 10: 73-84.
El-Gazzar, A. 1980. The taxonomic significance of leaf morphology in *Crataegus* (Rosaceae). *Bot. Jahrb. Syst.* 101: 457-469.
Miller, P. 1760. *Figures of Plants Described in the Gardener's Dictionary*, 1st ed., Vol. 2. Rivington et al., London.
———. 1768. *Gardeners' Dictionary*, 8th ed. London.
Moench, C. 1785. *Verzeichniss ausländischer Bäume und Stauden*. J. G. Fleischerschen Buchhandlung, Frankfurt.
Phipps, J. B. 1983. Biogeographic, taxonomic and cladistic relationships between Asiatic and North American *Crataegus*. *Ann. Missouri Bot. Gard.* 70: 667-700.
———. 1988. *Crataegus* (Maloideae, Rosaceae) of the southeastern United States, Introduction and series *Aestivales*. *J. Arnold Arbor.* 69: 401-431.
———. 1997. Monograph of northern Mexican *Crataegus*. *Sida, Bot. Miscell.* 15: 1-94.
———. 1998. Introduction to the red-fruited *Crataegus* (Rosaceae) of western North America. *Canad. J. Bot.* 56 (in press).
——— & M. Muniyamma. 1980. A taxonomic revision of *Crataegus* (Rosaceae) in Ontario. *Canad. J. Bot.* 56: 1621-1699.
———, ———, J. Rohrer & P. G. Smith. 1991. Origins and evolution of subfamily Maloideae (Rosaceae). *Syst. Bot.* 16: 303-332.
Sargent, C. S. 1890. *The Silva of North America*, Vol. 4. Houghton, Mifflin, Boston and New York.
———. 1922. *Manual of the Trees of North America*, 2nd ed., Vols. I, II. Houghton, Mifflin, Boston and New York.